Pressure solution deformation and its chemical composition in the rocks from Kumage Group, Shimanto belt in Tanegashima, Japan

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Along the Japanese island arc, there are outcrops of accretionary complex which have formed at various depths from the Paleozoic to the Quaternary in a relatively narrow range. Since 1980, various studies on accretionary complex of Japan have been conducted (Kano, 1998). The Kumage Group in Tanegashima belongs to the Southern Shimanto Belt and is composed of Nishi-no-omote Formation, Kadokurazaki Formation and Tateishi Formation. The geological age of the Kumage Group ranges from Middle to Late Eocene (Okada et al., 1982).Recently, Sakai (2010) proposed that the Kumage Group can be subdivided into Kumage Complex and Kadokurazaki Complex which are correlated with the geology in South Kyushu, the Hyuga Group and the Nichinan Group, respectively,. The Kumage Complex is composed of turbidites deformed associated with accretion, where the Kadokurazaki Complex is of olistostrome that consists of various size of blocks in mudstone without clear bedding. Deeply buried subducting material is often suffered by sheare along the plate boundary. Pressure solution deformation has been observed in the Shimanto Belt in Shikoku (Kawabata et al., 2007), showing positive correlations between pressure solution seam (PSS) density and concentration of the immobile chemical component (TiO2) and between PSS density and paleotemperature. This study aims to investigate relationship between development of pressure solution deformation and chemical composition in the Kumage Group of Tanegashima. We performed thin section observation, chemical component analysis using Electron Micro Probe (EMP), and examined data statistically using principal component analysis.

PSS was observed under optical microscope in the samples from middle (Kumage Complex) and southern (Kadokurazaki Complex) part of the island. In contrast, samples from northern part of the island (Kumage Complex) show almost no sign of pressure solution deformation. The results of the Electron Micro Probe (WDS area analysis) revealed positive Ti anomalies in the inner hinges of the micro-folded sandstone. The principal component analysis of the chemical composition data yielded principal components with major loading not only on Si component but also on Ti.

Our observation revealed pressure solution deformation was selectively developed along the boundary between sandstone and mudstone. As the samples from the Kadokurazaki Complex showed intense development of PSS, resulted probably from the higher content of sand/mud interface in the unit volume. Our results on the Electron Micro Probe (WDS area analysis) and principal component analysis confirmed that not only Ti but also other elements are capable of being the immobile reference and partially supports the validity of the work by Kawabata et al. (2007). Lower concentration of Ti in the PSS may be resulted from less shear stress compared to that of in the Kawabata et al. (2007)’ s case from Shikoku.

